# Impact of ASD traits on treatment outcomes of eating disorders in girls

Stewart, Catherine S.[1], McEwen, Fiona S.[2,3], Konstantellou, Anna[1], Eisler, Ivan[1], & Simic, Mima[1]

1. National and Specialist Child and Adolescent Eating Disorder Service, South London and Maudsley NHS Foundation Trust, Michael Rutter Centre, DeCrespigny Park, London, SE5 8AZ

2. Child & Adolescent Psychiatry and Social, Genetic and Developmental Psychiatry Centre, Institute of Psychiatry, Psychology & Neuroscience, King's College London, De Crespigny Park, London, SE5 8AF

3. Biological and Experimental Psychology, School of Biological and Chemical Sciences, Queen Mary University of London, Mile End Road, London, E1 4NS

Correspondence Address: Catherine Stewart. National and Specialist Child and Adolescent Eating Disorder Service, South London and Maudsley NHS Foundation Trust, Michael Rutter Centre, De Crespigny Park, London, SE5 8AZ

catherine.stewart@slam.nhs.uk

Telephone: 0203 2282545

Fax: 0203 228385

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Abstract

Evidence links high levels of Autism Spectrum Disorder Traits in women with chronicity of Anorexia Nervosa. This study reports through clinical audit the impact of ASD traits on treatment outcomes of girls who were referred for treatment in a specialist eating disorders service. Presence of current, but not early childhood, ASD traits was elevated in comparison with previously reported community samples. Current ASD traits were correlated with emotional disorders and with need for treatment augmentation (psychiatric inpatient or day patient admission), but this relationship was not significant after the contribution of depression had been controlled for. There was no difference in Morgan Russell Outcomes at discharge for those with high and low current ASD traits. Parent-reported ASD-related developmental difficulties were associated with attenuated change in self-reported cognitive symptoms of AN. This study highlights the need for further understanding of the aetiology, diagnostic significance and predictive utility for future relapse of elevated ASD traits in childhood eating disorders.

Keywords: Anorexia Nervosa; Autism Spectrum Disorder; Treatment; Outcomes

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Autism Spectrum Disorders (ASD) are more commonly diagnosed in males than females, but are over-represented within the predominantly female adult eating disorder (ED) population (Huke et al., 2013; Mandy & Tcahnturia, 2015; Rhind et al., 2014). It has been suggested that ASD and anorexia nervosa (AN) are related disorders which share common neuropsychological features (Gilberg & Rastam, 1992; Oldershaw et al., 2011 Lang, Lopez, Stahl, Tchanturia & treasure, 2014). However, the clinical and neuropsychological ASD traits observed in AN may instead reflect the impact of starvation on the brain (Pender, Gilbert & Serpell, 2014; Firk et al., 2015). It may also be that common clinical and research practices under detect or underdiagnose ASD in females (Halladay et al., 2015) and that a proportion of those who present with AN had a pre-existing undiagnosed ASD.

It has been reported that clinic samples of adult women with AN have diagnosable rates of ASD as high as 23% (Wentz et al., 2005) and greater self-reported ASD traits as reflected in higher scores on the Autism Quotient (AQ) than healthy controls (Westwood et al., 2015). Less is known about the presentation of ASD traits in children and adolescents with eating disorders. While association between eating disorder related behaviours and ASD traits have been reported in a community sample of early adolescents (Coombs, Brosnan, Bryant-Waugh & Skevington, 2011) no significant difference in prevalence of diagnosable ASD was found between young people diagnosed with an eating disorder and a community control group (Poonie, Ninteman, Bryant-Waugh, Nicholls & Mandy, 2012).

Restrictive eating disorders are potentially life threatening with little known about predictors of treatment response or the development of chronicity (Wonderlich et al., 2012). While greater treatment adherence has been associated with higher levels of ASD traits in a group of adults with AN (Huke et al., 2014), the long term outcomes for teenage-onset AN at 6, 10 and 18 year follow up are poorer for those who have met criteria for a diagnosis of ASD (Wentz et al., 2009; Nielsen et al., 2015). These papers are the product of large scale population study of people born between 1970

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and 1974. The treatment of eating disorders in childhood and adolescence has changed considerably since this cohort would have been adolescents, and little is known about the impact of ASD traits on response to current treatment in young people.

It has been suggested that ASD traits maintain difficulties with eating disorders (Tchanturia et al., 2013) and therefore require the development of specific interventions or the modification of existing interventions. Treatments of other mental health conditions have needed significant adaptations for young people with ASD (Wood et al., 2009; Ung, Selles, Small & Storch 2015). For young people with eating disorders, high levels of ASD traits may make it more difficult for them to make changes or to fully access psychological treatment (Tchanturia, Lounes & Holttum, 2014).

The study presented here is an audit of the impact of ASD traits on clinical outcomes for treatment of restrictive eating disorders in a specialist outpatient eating disorder service addressing the following questions:

1) Are levels of ASD traits elevated in this sample of girls with restrictive eating disorders?
2) Do elevated levels of ASD traits result in greater need for augmentation of treatment?
3) Do elevated levels of ASD traits result in poorer outcomes at the end of treatment?

## Method

### Design

This study was an audit of the treatment outcomes of girls referred to a specialist outpatient child and adolescent eating disorder service in London (being the main service provider for a catchment area population of just under 2,000,000) between September 2009 and October 2015 who were female, diagnosed at assessment with Anorexia Nervosa (AN, DSM-IV or DSM-5) or restrictive subtype Eating Disorder Not Otherwise Specified (EDNOS-R, DSM-IV) or other Specified Feeding or Eating disorder/ Atypical Anorexia (OSFED, DSM-5). Permission was given for this audit by the South London and Maudsley NHS Foundation Trust, Child and Adolescent Mental Health audit committee.

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Data had been collected as part of standard clinical care and was anonymised prior to inclusion in this audit. The purpose of the audit was to indicate whether treatment as usual (Family Therapy for Anorexia Nervosa, FT-AN, Eisler, Le Grange & Lock, 2015; Eisler et al., 2016) met the needs of girls with elevated ASD traits. Participants

All data was derived from standard clinical assessment at the National and Specialist Child and Adolescent Eating Disorder Service (CAEDS). Diagnoses were confirmed through clinical assessment comprising clinical interview with young person and parent, medical examination and Eating Disorders Examination Questionnaire (Fairburn & Beglin, 1994). Data was excluded from the audit if measures assessing autistic traits had not been completed by caregivers at assessment.

Measures

Demographics

Demographic data included in this audit were age, assessment and discharge % median body mass index (%mBMI), clinical diagnosis, duration of treatment, treatment received, and menstrual status at discharge. Morgan Russell Criteria were used to classify treatment outcomes (Good 85+ %mBMI with menstruation or premenarchal, Intermediate 85+ %mBMI without menstruation or bulimic symptoms averaging < 1 per week over the last month; poor: below 85% without menstruation or bulimic symptoms averaging $\geq$ 1 per week over the last month).

Self and Parent report measures

A standard battery of questionnaires is sent to young people and parents to complete at home prior to attending the clinic for assessment. Data derived from the following questionnaires was included in this audit: Eating disorders - Eating Disorders Examination Questionnaire self-report (Fairburn & Beglin, 1994: EDEQ); self-reported quality of life – Eating Disorder Quality of Life Scale (Adair et al., 2007); Depression - Moods and Feelings Questionnaire self and parent report (Angold et al., 1995: MFQ); Anxiety - Screen for Child Anxiety Related Disorders self and parent report (Birmaher et al.,

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1997, SCARED); Obsessive Compulsive Disorder (OCD) – Child Obsessional Compulsive Inventory, self and parent report (Safran et al., 2003: CHOCI). The Development and Well-Being Assessment (Goodman et al., 2000: DAWBA) parent-report of ASD related behaviours and difficulties assesses for symptoms of ASD in early childhood as well as current difficulties. Probability bands, indicating the likelihood of having ASD according to DSM-IV/ICD-10 criteria, are derived using a computer algorithm (YouthinMind, 2012) and a continuous symptom score can also be calculated (YouthinMind, 2013). Current ASD traits were measured using two further parent report measures – the Social Aptitude Scale (SAS, Liddle, Batty & Goodman, 2009) and the Autism Quotient (AQ, Baron-Cohen et al., 2006).

### Statistical analysis

Data analysis was conducted on IBM SPSS version 21. Chi squared analyses were conducted to compare distributions of ASD traits in girls referred to the service and population norms for girls derived from a UK wide survey of a representative sample, BCAMHS04 (Green, McGinnity, Meltzer, Ford & Goodman, 2005; Goodman, personal communication, August 2015) and to compare categorical outcomes between groups of girls with high and low ASD traits (AQ and SAS). Correlational analyses were performed between indices of ASD traits and outcome measures at assessment, and between indices of ASD traits and change in outcome measure, duration of treatment and %mBMI at discharge. Pearson's correlations are reported for AQ and SAS data and Spearman's Rho for correlations with the DAWBA ASD score. A Bonferroni correction was used within correlation analyses at each time point for each ASD measure such that a significance level of $p < .004$ was required.

## Results

### Sample

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Data analysed here is derived from a sample of 749 young people referred to the service between September 2009 and October 2015. The sample comprises a subset of these young people (n = 409) who met criteria for inclusion (see Figure 1, and Table 1 of supplementary materials for descriptive data). The mean age of the sample was 14.6 (s.d. = 1.76, range 9-18, mode = 14).

1. Are levels of ASD traits elevated in this sample of girls with restrictive eating disorders?

Of girls, 6.9% (20/289) of girls had a score on the AQ above the cut-off of 30 (Baron-Cohen et al., 2006). Baron-Cohen et al report that none of their female control group scored 29+. 15.4% (52/338) of girls's scores were below 16 on the SAS, indicative of reduced social aptitude (Liddle, Batty & Goodman, 2009).

Analysis comparing the distribution of DAWBA computer generated predictions of probability of presence of ASD between the current sample and that derived from the BCAMHS04 sample (Goodman, personal communication; mean age 15.0, s.d. 0.8) with the population norms as the reference data did not reveal a significant difference ($\chi^2$=8.60, df = 5, p>.05).

2. Do elevated levels of ASD traits result in greater need for augmentation of treatment

Chi squared analyses of augmentation of treatment for groups with high and low ASD traits as indexed by the AQ (cut off of 30) revealed proportionally greater augmentation of treatment for the high AQ group ( $\chi^2$= 7.30, df = 1, p <.01, see Figure 2) reflected in both admission to an intensive day patient programme ( $\chi^2$= 6.21 , df = 1, p <.025) and to psychiatric wards ($\chi^2$= 8.68, df = 1, p <.005) but not in greater use of paediatric medical admission ($\chi^2$= 0.27, df = 1, p >.05). In contrast, analyses of augmentation of treatment between the groups with high and low social aptitude as indexed by the SAS (cut off of 16) did not reveal any significant difference (all $\chi^2$< .2.6, df = 1, all p >.05).

[Insert Figure 2 about here]

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At assessment both AQ and DAWBA ASD scores were significantly correlated with parent reported symptoms of depression and of anxiety as well as self-reported quality of life. In addition AQ scores were significantly correlated with parent reported obsessive compulsive traits as well as self-reported anxiety and depression. ASD traits were not significantly correlated with EDEQ scales or global scores (see supplementary materials table 2).

Given the potential confound between parent reports of ASD and depression and anxiety a binary logistic regression was performed to analyse the predictive utility of AQ on treatment augmentation after controlling for parent reported depression and anxiety. This revealed parent reported depression ($B$ = 0.04, $p$ <.01) as a significant predictor of the need for treatment augmentation, with neither anxiety nor AQ score making a significant contribution to the model (both $p$ >.77).

3. Do elevated levels of ASD traits result in poorer outcomes at the end of treatment?

Physical outcome at discharge were compared using the Morgan Russell criteria for physical health. Chi squared analyses of the difference in distribution between outcome categories for the high and low ASD trait groups, as indexed by AQ and SAS (see figure 2) did not reveal significant differences in distribution of outcomes (all $\chi^2$<3.02, df = 2, all, p >.05).

[Insert Figure 2 about here]

At discharge correlations between indices of ASD traits and change scores on symptom outcome measures were non-significant except between DAWBA ASD score and the EDEQ subscales of weight concern, shape concern and the global score (all $p$ <.004). Less change was associated with higher DAWBA ASD scores (see supplementary materials table32).

## Discussion

This study of girls referred for treatment of restrictive eating disorders demonstrates a clear elevation in current ASD traits measured by the AQ and SAS above what would be expected in the



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general population. However, there was no evidence of increased ASD-related developmental concerns, measured using the ASD module of the DAWBA, consistent with a previous report (Pooni et al., 2012). There are a number of possible explanations for this finding. It may be that the elevation in ASD traits measured at assessment, when young people with restrictive eating disorders are in a state of starvation, reflects the impact of a lack of adequate nutrition on social, emotional and cognitive processes which results in social withdrawal, reduction in communication and restricted or repetitive behaviours (Pender et al., 2014; Firk et al., 2015), rather than a neurodevelopmental disorder per se. Alternatively, it has been suggested that the tools currently used to diagnose ASD do not adequately identify early indicators of difficulty in girls who may have a qualitatively different presentation to that of boys (Halladay et al., 2015). The replication of the finding (Pooni et al., 2012) that elevated ASD traits in an eating disordered group do not co-occur with parental reports of early developmental difficulties consistent with ASD highlights the need for further understanding of the aetiology and diagnostic significance of elevated ASD traits in eating disorders.

This clinical audit indicates that treatment as usual in a specialist eating disorders service resulted in comparable physical outcomes and length of treatment required across levels of ASD traits. It is notable that the service from which this data was collected used FT-AN (Eisler et al., 2000) as first line treatment as usual, with additional CBT for low mood, anxiety or OCD where indicated after a healthy weight has been restored. Much of the adaptation in treatments that has been reported for young people with ASD has been for Cognitive Behavioural Therapy (Attwodd, 2003; Ung et al., 2015). The findings of this audit may not be generalisable to services offering other treatments for eating disorders.

However, there was a significant relationship between ASD related developmental concerns and change in eating related concerns (EDEQ global, weight and shape concern). This reflects less change with higher levels of ASD related developmental concerns. This attenuation of cognitive change may

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indicate a risk factor for future relapse. This would be consistent with reports from the adult literature of higher levels of ASD in people diagnosed with anorexia, and therefore may indicate a need to identify and develop interventions for young people who may be at greater future risk.

While ASD traits were not seen to be associated with the degree of change reported by either parents or girls in symptoms of depression, anxiety or OCD, they were highly associated with reports of these at assessment. This may be explained by an exacerbation of ASD traits with a higher degree of psychological distress, or through the measures of current ASD traits capturing the social and emotional consequences of an eating disorder rather than a neurodevelopmental disorder. Alternatively, given reliance on parental report of ASD traits in this study there may be an artefact in endorsement of many difficulties at a time of marked stress and concern for families whose young people require treatment for an eating disorder.

There was a significant difference in the need for service augmentation for girls with high levels of ASD traits as indexed by the AQ. This reflects greater use of the intensive day patient provision within the service and greater use of psychiatric admission. However, ASD traits were correlated with reports of symptoms of depression, anxiety and OCD at assessment and the AQ score did not predict the use of treatment augmentation after levels of either self or parent reported depression had been accounted for. Thus the need for treatment augmentation may reflect greater emotional need rather than need related to ASD.

Limitations

Although the use of parent as well as self report measures is a strength of the data presented here, interpretation of the findings is limited by an absence of the use of observational methods or clinical interviews. This may introduce a bias towards over-reporting of symptoms in a subset of participants, though it is noteworthy that clinical measures are not all inter-correlated suggesting that participants were able to differentiate between symptoms associated with different disorders.

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Recent research in adult clinical populations has highlighted that Generalised Anxiety Disorder can lead to false positives on the adult AQ (Ashwood et al., 2016). It is not possible to fully delineate whether the elevation of ASD traits and subsequent levels of service augmentation reflect over-reporting of all symptoms or differential effects on treatment outcome of ASD or depressive symptomatology. Moreover, there is no measure of the level of ASD traits at discharge. As such it is not possible to identify girls for whom ASD traits persisted after refeeding in order to ascertain whether these girls, perhaps with neurodevelopmental difficulties, varied in outcome, or whether ASD traits measured at assessment reflected a true trait or a state related to starvation. Analysis is further limited by the relatively small sample size restricting the number of girls with elevated ASD traits; the DAWBA data did not allow for a categorical comparison of treatment outcomes.

## Conclusions

This audit has demonstrated that treatment as usual offered by this service does not result in statistically different physical outcomes for girls with elevated levels of ASD traits. However, it is notable that there is some evidence of an attenuation of change in the cognitive symptoms of eating disorders for those with higher levels of ASD related developmental concerns, alongside a greater need for treatment augmentation during treatment, which is indicative of a need for further research to elucidate the associations between neurodevelopment, starvation, psychological distress and persistence into adulthood of AN.

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Figure Legends

Figure 1: Consort diagram depicting participants included at each stage of the audit. The two samples analysed were the Intake Assessment Sample (n = 409) and the end of treatment sample (n = 286).

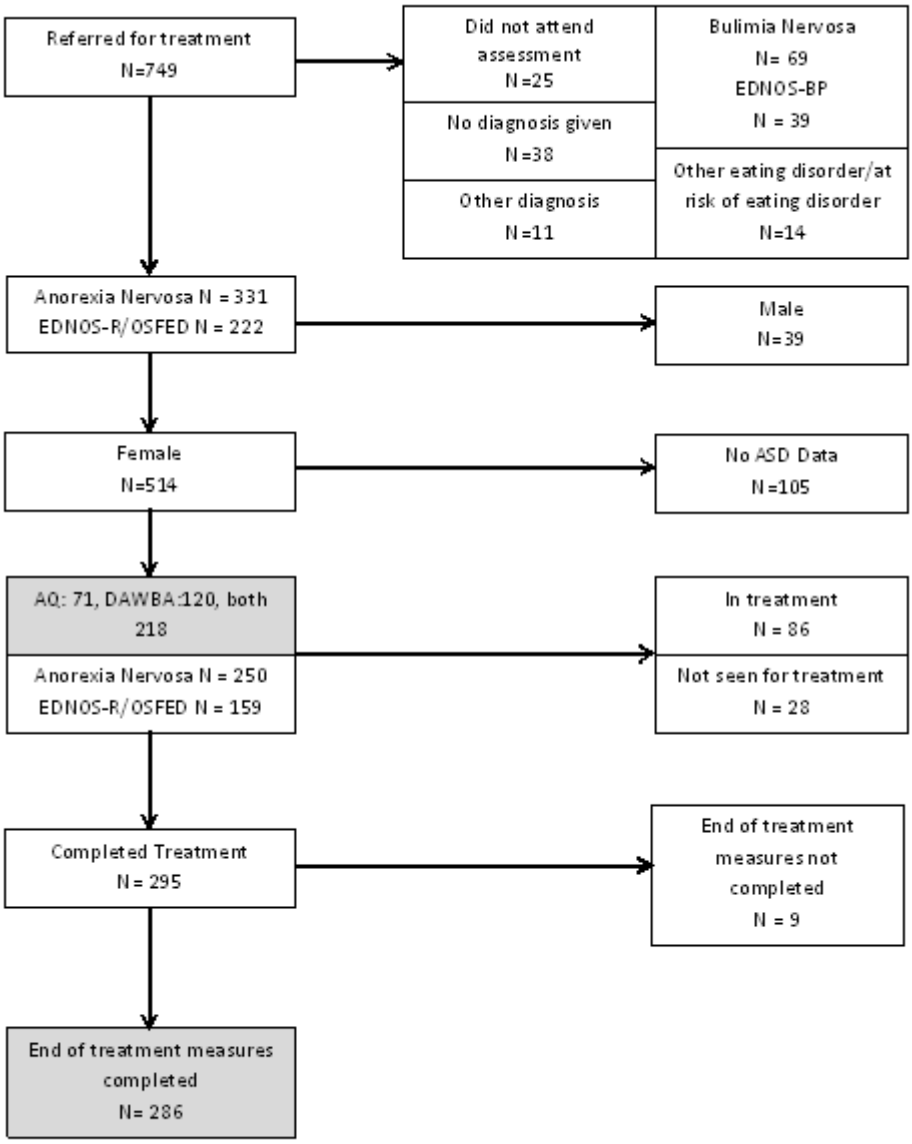

Figure 2: Graph to show % of end of treatment sample that had required treatment augmentation according to high or low ASD traits.

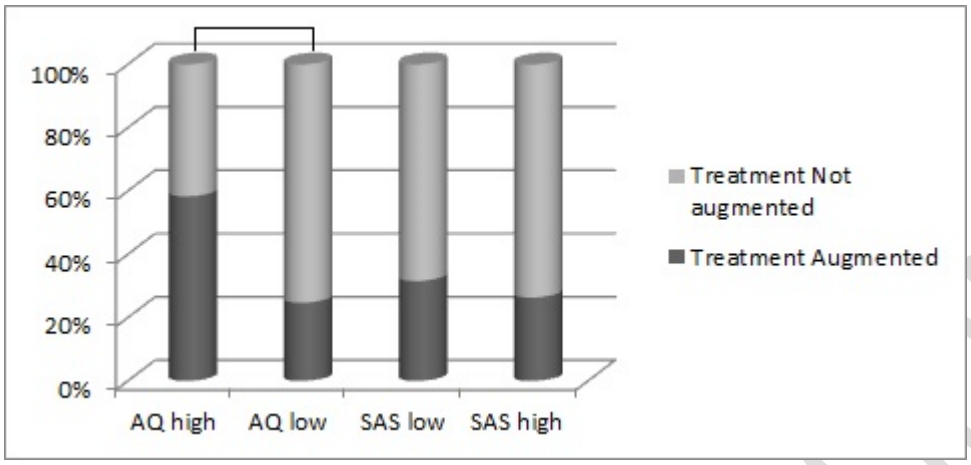


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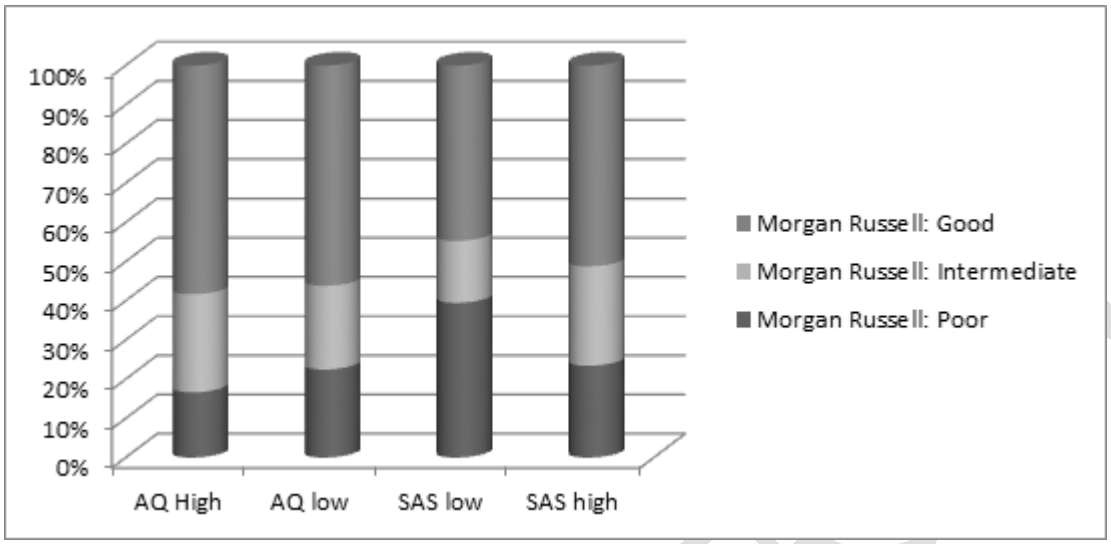
Figure 3: Graph to show Morgan Russell criteria outcomes of % of end of treatment sample according to high or low ASD traits.

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